PALM Intranet

Application Number SEARCH

IDS Flag Clearance for Application 10535587

IDS Information

Content	Mailroom Date	Entry Number	IDS Review	Reviewer
M844	05-18-2005	11	☑	03-01-2006 10:24:53 BShrivastav

UPDATE

Refine Search

Search Results -

Term	Documents
(18 AND 16 AND 15 AND 14 AND 17 AND 21).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15
(L21 AND L18 AND L17 AND L16 AND L15 AND L14).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15

Database: US Pre-Grant Publication Full-Text Database; US Patents Full-Text Database; US OCR Full-Text Database; EPO Abstracts Database; JPO Abstracts Database; Derwent World Patents Index; IBM Technical Disclosure Bulletins

Search: L22

Refine Search | Recall Text | Clear | Interrupt

Search History

DATE: Tuesday, March 28, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ		
L22	L21 and L18 and L17 and L16 and L15 and L14	15	L22
L21	((computer with program) or (computer adj readable with medium) or (program with code))	516213	L21
L20	L19 and L13	36	L20
L19	L18 and L17 and L16 and L15 and L14	47	L19
L18	((navigatoe) or (phase-correction) or (phase-encod$4))	1899	L18
L17	((macroscopic with motion) or motion)	1275531	L17
L16	((read-out or frequency) adj gradient) and (phase or (phase-encoding) adj gradient) or phase-encoding	1450	L16
L15	(diffusion adj weighted) or (Diffusion adj coefficient) or (diffusion adj	13081	L15

	gradient)		
L14	((magnetic adj resonance) or NMR or MRI)	223107	L14
L13	(324/300 |324/301 |324/302 |324/303 |324/304 |324/305 |324/306 |324/307 |324/308 |324/309 |324/310 |324/311 |324/312 |324/313 |324/314 |324/315 |324/316 |324/317 |324/318 |324/319 |324/320 |324/321 |324/322).ccls. or (600/410.419).ccls. or (345/424 |345/419).ccls.	11421	L13
L12	6076006	8	L12
L11	L10 and L7 and L6 and L5 and L4 and L3	15	L11
L10	((computer with program) or (computer adj readable with medium) or (program with code))	516213	L10
L9	L8 and L2	36	L9
L8	L7 and L6 and L5 and L4 and L3	47	L8
L7	((navigatoe) or (phase-correction) or (phase-encod$4))	1899	L7
L6	((macroscopic with motion) or motion)	1275531	L6
L5	((read-out or frequency) adj gradient) and (phase or (phase-encoding) adj gradient) or phase-encoding	1450	L5
L4	(diffusion adj weighted) or (Diffusion adj coefficient) or (diffusion adj gradient)	13081	L4
L3	((magnetic adj resonance) or NMR or MRI)	223107	L3
L2	(324/300-322).ccls. or (600/410.419).ccls. or (345/424,419).ccls.	11421	L2
L1	6076006	8	L1

END OF SEARCH HISTORY

Refine Search

Search Results -

Term	Documents
(18 AND 16 AND 15 AND 14 AND 17 AND 21).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15
(L21 AND L18 AND L17 AND L16 AND L15 AND L14).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15

Database: US Pre-Grant Publication Full-Text Database; US Patents Full-Text Database; US OCR Full-Text Database; EPO Abstracts Database; JPO Abstracts Database; Derwent World Patents Index; IBM Technical Disclosure Bulletins

Search: L22

Refine Search | Recall Text | Clear | Interrupt

Search History

DATE: Tuesday, March 28, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ		
L22	L21 and L18 and L17 and L16 and L15 and L14	15	L22
L21	((computer with program) or (computer adj readable with medium) or (program with code))	516213	L21
L20	L19 and L13	36	L20
L19	L18 and L17 and L16 and L15 and L14	47	L19
L18	((navigatoe) or (phase-correction) or (phase-encod$4))	1899	L18
L17	((macroscopic with motion) or motion)	1275531	L17
L16	((read-out or frequency) adj gradient) and (phase or (phase-encoding) adj gradient) or phase-encoding	1450	L16
L15	(diffusion adj weighted) or (Diffusion adj coefficient) or (diffusion adj	13081	L15

	gradient)		
L14	((magnetic adj resonance) or NMR or MRI)	223107	L14
L13	(324/300 |324/301 |324/302 |324/303 |324/304 |324/305 |324/306 |324/307 |324/308 |324/309 |324/310 |324/311 |324/312 |324/313 |324/314 |324/315 |324/316 |324/317 |324/318 |324/319 |324/320 |324/321 |324/322).ccls. or (600/410.419).ccls. or (345/424 |345/419).ccls.	11421	L13
L12	6076006	8	L12
L11	L10 and L7 and L6 and L5 and L4 and L3	15	L11
L10	((computer with program) or (computer adj readable with medium) or (program with code))	516213	L10
L9	L8 and L2	36	L9
L8	L7 and L6 and L5 and L4 and L3	47	L8
L7	((navigatoe) or (phase-correction) or (phase-encod$4))	1899	L7
L6	((macroscopic with motion) or motion)	1275531	L6
L5	((read-out or frequency) adj gradient) and (phase or (phase-encoding) adj gradient) or phase-encoding	1450	L5
L4	(diffusion adj weighted) or (Diffusion adj coefficient) or (diffusion adj gradient)	13081	L4
L3	((magnetic adj resonance) or NMR or MRI)	223107	L3
L2	(324/300-322).ccls. or (600/410.419).ccls. or (345/424,419).ccls.	11421	L2
L1	6076006	8	L1

END OF SEARCH HISTORY

Refine Search

Search Results -

Term	Documents
(18 AND 16 AND 15 AND 14 AND 17 AND 21).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15
(L21 AND L18 AND L17 AND L16 AND L15 AND L14).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15

Database: US Pre-Grant Publication Full-Text Database; US Patents Full-Text Database; US OCR Full-Text Database; EPO Abstracts Database; JPO Abstracts Database; Derwent World Patents Index; IBM Technical Disclosure Bulletins

Search: L22

Refine Search | Recall Text | Clear | Interrupt

Search History

DATE: Tuesday, March 28, 2006 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=YES; OP=ADJ		
L22	L21 and L18 and L17 and L16 and L15 and L14	15	L22
L21	((computer with program) or (computer adj readable with medium) or (program with code))	516213	L21
L20	L19 and L13	36	L20
L19	L18 and L17 and L16 and L15 and L14	47	L19
L18	((navigatoe) or (phase-correction) or (phase-encod$4))	1899	L18
L17	((macroscopic with motion) or motion)	1275531	L17
L16	((read-out or frequency) adj gradient) and (phase or (phase-encoding) adj gradient) or phase-encoding	1450	L16
L15	(diffusion adj weighted) or (Diffusion adj coefficient) or (diffusion adj	13081	L15

	gradient)		
L14	((magnetic adj resonance) or NMR or MRI)	223107	L14
L13	(324/300 |324/301 |324/302 |324/303 |324/304 |324/305 |324/306 |324/307 |324/308 |324/309 |324/310 |324/311 |324/312 |324/313 |324/314 |324/315 |324/316 |324/317 |324/318 |324/319 |324/320 |324/321 |324/322).ccls. or (600/410.419).ccls. or (345/424 |345/419).ccls.	11421	L13
L12	6076006	8	L12
L11	L10 and L7 and L6 and L5 and L4 and L3	15	L11
L10	((computer with program) or (computer adj readable with medium) or (program with code))	516213	L10
L9	L8 and L2	36	L9
L8	L7 and L6 and L5 and L4 and L3	47	L8
L7	((navigatoe) or (phase-correction) or (phase-encod$4))	1899	L7
L6	((macroscopic with motion) or motion)	1275531	L6
L5	((read-out or frequency) adj gradient) and (phase or (phase-encoding) adj gradient) or phase-encoding	1450	L5
L4	(diffusion adj weighted) or (Diffusion adj coefficient) or (diffusion adj gradient)	13081	L4
L3	((magnetic adj resonance) or NMR or MRI)	223107	L3
L2	(324/300-322).ccls. or (600/410.419).ccls. or (345/424,419).ccls.	11421	L2
L1	6076006	8	L1

END OF SEARCH HISTORY

Hit List

First Hit | Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 15 of 15 returned.

☐ 1. Document ID: US 20060001424 A1 Relevance Rank: 49

Using default format because multiple data bases are involved.

L11: Entry 2 of 15 File: PGPB Jan 5, 2006

PGPUB-DOCUMENT-NUMBER: 20060001424
PGPUB-FILING-TYPE:
DOCUMENT-IDENTIFIER: US 20060001424 A1

TITLE: Magnetic resonance method and device

PUBLICATION-DATE: January 5, 2006

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Harvey; Paul Royston	Eindhoven		NL
Van Den Brink; Johan Samuel	Eindhoven		NL

US-CL-CURRENT: 324/309; 324/306, 324/307

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw D

☐ 2. Document ID: US RE35656 E Relevance Rank: 43

L11: Entry 14 of 15 File: USPT Nov 11, 1997

US-PAT-NO: RE35656
DOCUMENT-IDENTIFIER: US RE35656 E

TITLE: Ultra-fast multi-section MRI using gradient and spin echo (GRASE) imaging

DATE-ISSUED: November 11, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Feinberg; David A.	New York	NY		
Oshio; Koichi	Brookline	MA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE

Brigham & Women's Hospital, Inc. Boston MA 02

APPL-NO: 08/515177 [PALM]
DATE FILED: August 15, 1995

REISSUE-DATA:

US-PAT-NO	DATE-ISSUED	APPL-NO	DATE-FILED
05270654	December 14, 1993	727229	July 5, 1991

INT-CL-ISSUED: [06] G01 V 3/00

US-CL-ISSUED: 324/309; 324/307
US-CL-CURRENT: 324/309; 324/307

FIELD-OF-CLASSIFICATION-SEARCH: 324/307, 324/309, 324/306, 324/312, 324/300
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4021726	May 1977	Garroway et al.	
4684891	August 1987	Feinberg	
4697148	September 1987	Strobel	
4746864	May 1988	Satoh	
4792758	December 1988	Sattin	
4796635	January 1989	Dumoulin	
4800889	January 1989	Dumoulin et al.	
4818940	April 1989	Henig	
4818942	April 1989	Rzedzian	
4833407	May 1989	Holland et al.	
4871967	October 1989	Rotem et al.	
4893081	January 1990	Zur	
4896112	January 1990	Ratzel et al.	
4896113	January 1990	Pele	
4901020	February 1990	Ladebeck et al.	
4959611	September 1990	Brovost et al.	
4970465	November 1990	Hagiwara	
5043665	August 1991	Kuhara et al.	
5055789	October 1991	Kondo et al.	
5361028	November 1994	Kanayama et al.	324/307

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0175184	August 1985	EP	
0318212	May 1989	EP	

WO 91/02263 February 1991 WO

OTHER PUBLICATIONS

Crooks et al, "Nuclear Magnetic Resonance", Apr. 1982, vol. 143, No. 1, Nuclear Magnetic Resonance Whole-Body Imager Operating at 3.5 K Gauss.sup.1, pp. 169-174.
Hennig & Friedburg, "Clinical Applications and Methodological Developments of the Rare Technique", Magnetic Resonance Imaging, vol. 6, No. 4, 1988, pp. 391-395.
Hennig et al, "Rare imaging: A Fast Imaging Method for Clinical MR", Magnetic Resonance in Medicine 3 (1986), pp. 823-833.
Rzedzian et al, "Instant Images of the Human Heart Using a New, Whole-Body MR Imaging System", American J. Roentgenol, vol. 149, Aug. 1987, pp. 245-250.
Feinberg et al, "Multiple Spin-Echo Magnetic Resonance Imaging", Radiology, 1985, vol. 155, pp. 237-442.
Hahn, "Spin Echoes", Physical Review, vol. 80, No. 4, Nov. 15, 1950, pp. 580-594.
Mansfield, "Multi-Planar Image Formation Using NMR Spin Echoes", J. Phys. C: Solid State Phys., vol. 10, 1977; pp. L55-L58.
Feinberg et al, "Echo Planar-Inner Volume Imaging at 0.35T", Proceedings of Fifth Annual Meeting of The Society of Magnetic Resonance in Medicine, p. 950.
Feinberg et al, "Halving MR Imaging Time by Conjugation: Demonstration at 3.5 kG", Radiology, 1986, vol. 161, pp. 527-531.
Ordidge et al, "Snapshot Imaging at 0.5T Using Echo-Planar Techniques", Magnetic Resonance in Medicine, vol. 10 (1989), pp. 227-240.
Pykett et al, "Instant Images of the body by Magnetic Resonance", Magnetic Resonance in Medicine, vol. 5 (1987), pp. 563-571.
Feinberg et al, "Echo-Planar Imaging with Asymmetric Gradient Modulation and Inner-Volume Excitation", Magnetic Resonance in Medicine, vol. 13, (1990), pp. 162-169.
Feinberg et al, "Tissue Perfusion in Humans Studied by Fourier Velocity Distribution, Line Scan, and Echo-Planar Imaging", Magnetic Resonance in Medicine, vol. 16, (1990), pp. 280-293.
Oshio et al, "A Computer Simulation of T.sub.2 Decay Effects in Echo Planar Imaging", Magnetic Resonance in Medicine, vol. 11 (1989), pp. 389-397.
Mansfield et al, "Zonally Magnified EPI in Real Time by NMR", J. Phys. E:Sci Instrum., vol. 21 (1988), pp. 275-279.
Mansfield et al, "Planar Spin Imaging by NMR", Journal of Magnetic Resonance, vol. 27, pp. 101-119.

ART-UNIT: 225

PRIMARY-EXAMINER: Arana; Louis M.

ATTY-AGENT-FIRM: Nixon & Vanderhye P.C.

ABSTRACT:

Fast magnetic resonance imaging uses combined gradient echoes and spin echoes. In each of one or more TR intervals, after an initial NMR RF nutation pulse, a sequence of 180.degree. RF nutation pulses is used to refocus the RF response into corresponding string of spin echoes. However, in addition, during the time that such spin echo would normally occur after each such 180.degree. RF nutation pulse, a plurality of alternating polarity read-out magnetic gradient pulses is utilized so as to very rapidly form a sub-sequence of gradient echoes. This fast multi-section MRI sequence utilizes the speed advantages of gradient refocusing while overcoming the image artifacts arising from static field homogeneity and chemical shift. Image contrast is still determined by the T2 contrast in Hahn spin echoes. A novel k-space trajectory temporally modulates signals and demodulates artifacts. The echo responses are selectively phase-encoded and time shifted in occurrence so

as to smoothly distribute unwanted phase shift from field inhomogeneity and/or chemical phase shift effects over the entire phase encoded dimension in k-space. The technique can also be extended so as to provide T2-weighted multi-slab three-dimensional volume images.

60 Claims, 19 Drawing figures

☐ 3. Document ID: US 5270654 A Relevance Rank: 43

L11: Entry 15 of 15 File: USPT Dec 14, 1993

US-PAT-NO: 5270654
DOCUMENT-IDENTIFIER: US 5270654 A
**** See image for Certificate of Correction ****

TITLE: Ultra-fast multi-section MRI using gradient and spin echo (grase) imaging

DATE-ISSUED: December 14, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Feinberg; David A.	Berkeley	CA	94708	
Oshio; Koichi	Brookline	MA	02146	

APPL-NO: 07/727229 [PALM]
DATE FILED: July 5, 1991

INT-CL-ISSUED: [05] G01 V 3/00

US-CL-ISSUED: 324/309; 324/307
US-CL-CURRENT: 324/309; 324/307

FIELD-OF-CLASSIFICATION-SEARCH: 324/300, 324/312, 324/313, 324/314, 324/307, 324/309, 128/653.2
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4021726	May 1977	Garroway et al.	324/309
4684891	August 1987	Feinberg	324/309
4792758	December 1988	Sattin	324/309
4796635	January 1989	Dumoulin	128/653
4800889	January 1989	Dumoulin et al.	128/653
4818942	April 1989	Rzedzian	324/312

4833407	May 1989	Holland et al.	324/309
4871967	October 1989	Rotem et al.	324/309
4893081	January 1990	Zur	324/309
4896112	January 1990	Ratzel et al.	324/309
4896113	January 1990	Pele	324/309
4901020	February 1990	Ladebeck et al.	324/309
4959611	September 1990	Brovost et al.	324/309
4970465	November 1990	Hagiwara	324/307
5043665	August 1991	Kuhara et al.	324/309
5055789	October 1991	Kondo et al.	324/309

OTHER PUBLICATIONS

Nuclear Magnetic Resonance, Apr. 1982, vol. 143, No. 1, Crooks et al., "Nuclear Magnetic Resonance Whole-Body Imager Operating at 3.5 K Gauss.sup.1 ", pp. 169-174.
Magnetic Resonance Imaging, vol. 6, No. 4, 1988, Hennig & Friedburg, "Clinical Applications and Methodological Developments of the Rare Technique," pp. 391-395.
Magnetic Resonance in Medicine 3 (1986), Hennig et al.: "Rare Imaging: A Fast Imaging Method for Clinical MR", pp. 823-833.
American J. Roentgenol, vol. 149, Aug. 1987, Rzedzian et al.: "Instant Images of the Human Heart Using a New, Whole-Body MR Imaging System," pp. 245-250.
Radiology, 1985, vol. 155, Feinberg et al.: "Multiple Spin-Echo Magnetic Resonance Imaging," pp. 237-442.
Physical Review, vol. 80, No. 4, Nov. 15, 1950, Hahn: "Spin Echoes," pp. 580-594.
J. Phys. C: Solid State Phys., vol. 10, 1977, Mansfield: "Multi-Planar Image Formation Using NMR Spin Echoes," pp. L55-L58.
Proceedings of Fifth Annual Meeting of the Society of Magnetic Resonance in Medicine, Feinberg et al.: "Echo Planar-Inner Volume Imaging at 0.35T," p. 950.
Radiology 1986, vol. 161, Feinberg et al.: "Halving MR Imaging Time by Conjugation: Demonstration at 3.5 kG," pp. 527-531.
Magnetic Resonance in Medicine, vol. 10, (1989), Ordidge et al.: "Snapshot Imaging at 0.5T Using Echo-Planar Techniques," pp. 227-240.
Magnetic Resonance in Medicine, vol. 5, (1987), Pykett et al.: "Instant Images of the Body by Magnetic Resonance," pp. 563-571.
Magnetic Resonance in Medicine, vol. 13, (1990), Feinberg et al.: "Echo-Planar Imaging with Asymmetric Gradient Modulation and Inner-Volume Excitation," pp. 162-169.
Magnetic Resonance in Medicine, vol. 16, (1990), Feinberg et al.: "Tissue Perfusion in Humans Studied by Fourier Velocity Distribution, Line Scan, and Echo-Planar Imaging," pp. 280-293.
Magnetic Resonance in Medicine, vol. 11, (1989), Oshio et al.: "A Computer Simulation of T.sub.2 Decay Effects in Echo Planar Imaging," pp. 389-397.
J. Phys. E: Sci. Instrum., vol. 21 (1988), Mansfield et al.: "Zonally Magnified EPI in Real Time by NMR," pp. 275-279.
Journal of Magnetic Resonance, vol. 27, Mansfield et al.: "Planar Spin Imaging by NMR," pp. 101-119.

ART-UNIT: 263

PRIMARY-EXAMINER: Arana; Louis

ATTY-AGENT-FIRM: Nixon & Vanderhye

ABSTRACT:

Fast magnetic resonance imaging uses combined gradient echoes and spin echoes. In each of one or more TR intervals, after an initial NMR RF nutation pulse, a sequence of 180.degree. RF nutation pulses is used to refocus the RF response into corresponding string of spin echoes. However, in addition, during the time that such spin echo would normally occur after each such 180.degree. RF nutation pulse, a plurality of alternating polarity read-out magnetic gradient pulses is utilized so as to very rapidly form .a sub-sequence of gradient echoes. This fast multi-section MRI sequence utilizes the speed advantages of gradient refocusing while overcoming the image artifacts arising from static field homogeneity and chemical shift. Image contrast is still determined by the T2 contrast in Hahn spin echoes. A novel k-space trajectory temporally modulates signals and demodulates artifacts. The echo responses are selectively phase-encoded and time shifted in occurrence so as to smoothly distribute unwanted phase shift from field inhomogeneity and/or chemical phase shift effects over the entire phase encoded dimension in k-space. The technique can also be extended so as to provide T2-weighted multi-slab three-dimensional volume images.

48 Claims, 19 Drawing figures

☐ 4. Document ID: US 20030160612 A1 Relevance Rank: 39

L11: Entry 7 of 15 File: PGPB Aug 28, 2003

PGPUB-DOCUMENT-NUMBER: 20030160612
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030160612 A1

TITLE: Magnetic resonance method and system for quantification of anisotropic diffusion

PUBLICATION-DATE: August 28, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Yablonskiy, Dmitriy A.	St. Louis	MO	US
Sukstanskii, Alexander L.	St. Louis	MO	US
Conradi, Mark S.	St. Louis	MO	US

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	COUNTRY	TYPE CODE
Washington University				02

APPL-NO: 10/345010 [PALM]
DATE FILED: January 15, 2003

RELATED-US-APPL-DATA:
non-provisional-of-provisional 60349170 20020116 US

INT-CL-PUBLISHED: [07] G01 V 3/00

US-CL-PUBLISHED: 324/309; 324/318, 324/307
US-CL-CURRENT: 324/309; 324/307, 324/318 .

REPRESENTATIVE-FIGURES: 4, 6

ABSTRACT:

An MR method and system of determining elements of the apparent diffusion coefficient tensor in a material with plurality of anisotropic structural units that can be too small to be resolved by direct imaging. MR data is acquired with MR system including pulse sequences, the sequences including imaging or spectroscopy pulse sequences with a series of embedded diffusion-sensitizing gradient waveforms with different gradient strength applied to the material. A nonlinear function of a b-value corresponding to the pulse sequence is defined and the acquired MR data is processed according to defined nonlinear function. Images/maps of the components of the tensor of apparent diffusion coefficients, corresponding to anisotropic structural units, based on the processed MR data, are created. A method of evaluating of the geometrical parameters of lung airways is also described.

☐ 5. Document ID: US 6307369 B1 Relevance Rank: 39

L11: Entry 12 of 15 File: USPT Oct 23, 2001

US-PAT-NO: 6307369
DOCUMENT-IDENTIFIER: US 6307369 B1

TITLE: Autocorrection of 3D MR images for motion artifacts

DATE-ISSUED: October 23, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Felmlee; Joel P.	Rochester	MN		
McGee; Kiaran P.	Rochester	MN		
Ehman; Richard L.	Rochester	MN		
Manduca; Armando	Rochester	MN		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Mayo Foundation for Medical Education and Research	Rochester	MN			02

APPL-NO: 09/614893 [PALM]
DATE FILED: July 12, 2000

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/309; 324/307, 324/312

US-CL-CURRENT: 324/309; 324/307, 324/312

FIELD-OF-CLASSIFICATION-SEARCH: 324/309, 324/307, 324/300, 324/318, 324/312, 128/653
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5729140	March 1998	Kruger et al.	324/309
6184682	February 2001	Ehman et al.	324/309

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
WO98/01828	January 1998	WO	

OTHER PUBLICATIONS

Autofocusing of Clinical Shoulder MR Images for Correction of Motion Artifacts, Mayo Clinic, Rochester MN, Manduca, et al.
Automatic Correction of Motion Artifacts in Magnetic Resonance Images Using an Entropy Focus Criterion, IEEE Transactions on Medical Imaging, vol. 16, No. 6, Dec. 1997, Atkinson, et al.
An Autofocus Algorithm for the Automatic Correction of Motion Artifacts in MR Images, Lecture Notes in Computer Science, 15.sup.th International Conference, IPMI '97, Atkinson, et al.
A Respiratory Motion Artifact Reduction Method In Magnetic Resonance Imaging of the Chest, IEEE Transactions on Medical Imaging, vol. 10, No. 1, Mar. 1991, Atalar, et al.
Motion Artifact Suppression: A Review of Post-Processing Techniques, MRI, vol. 10, pp 627-635, 1992, Hedley, et al.
Diffusion-Weighted Multiple Shot Echo Planar Imaging of Humans without Navigation, MRM 38 82-88 1997, Robson, et al.
MRI Artifact Cancellation Due to Rigid Motion in the Imaging Plane, IEEE Transactions on Medical Imaging, vol. 15, No. 6, Dec. 1996, Zoroofi, et al.
An Improved Algorithm for 2-D Translation Motion Artifact Correction, IEEE Transaction on Medical Imaging, vol. 10, No. 4, Dec. 1991, Hedley, et al.

ART-UNIT: 282

PRIMARY-EXAMINER: Patidar; Jay

ASSISTANT-EXAMINER: Shrivastav; Brij B.

ATTY-AGENT-FIRM: Quarles & Brady, LLP

ABSTRACT:

A three-dimensional image data set is acquired with an MRI system and autocorrected to reduce artifacts caused by subject motion during image acquisition. Correction

for motion along one or two axes is performed by selecting a 2D slice of data and autocorrecting it to produce phase corrections that are then made to the entire 3D image data set. This may be repeated by autocorrecting an additional 2D slice perpendicular to the first 2D slice to produce phase corrections for the 3D image data set for motion along the third axis.

9 Claims, 3 Drawing figures

☐ 6. Document ID: US 6265874 B1 Relevance Rank: 39

L11: Entry 13 of 15 File: USPT Jul 24, 2001

US-PAT-NO: 6265874
DOCUMENT-IDENTIFIER: US 6265874 B1

TITLE: Autocorrection of MR images using multiple metrics

DATE-ISSUED: July 24, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
McGee; Kiaran	Rochester	MN		
Felmlee; Joel P.	Rochester	MN		
Ehman; Richard L.	Rochester	MN		
Manduca; Armando	Rochester	MN		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Mayo Foundation For Medical Education and Research	Rochester	MN			02

APPL-NO: 09/576191 [PALM]
DATE FILED: May 23, 2000

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/312; 324/306
US-CL-CURRENT: 324/312; 324/306

FIELD-OF-CLASSIFICATION-SEARCH: 324/306, 324/307, 324/309, 324/312, 324/314, 324/300, 364/419.13, 600/410, 600/407, 358/447
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5432447	July 1995	Song	324/309
5568384	October 1996	Robb et al.	364/419.13
5767987	June 1998	Wolff et al.	358/447

OTHER PUBLICATIONS

Autofocusing of Clinical Shoulder MR Images for Correction of Motion Artifacts, Mayo Clinic, Rochester MN, Manduca, et al. (date unknown).
Automatic Correction of Motion Artifacts in Magnetic Resonance Images Using an Entropy Focus Criterion, IEEE Transactions on Medical Imaging, vol. 16, No. 6, Dec. 1997, Atkinson, et al.
An Autofocus Algorithm for the Automatic Correction of Motion Artifacts in MR Images, Lecture Notes in Computer Science, 15.sup.th International Conference, IPMI '97, Atkinson, et al.
A Respiratory Motion Artifact Reduction Method In Magnetic Resonance Imaging of the Chest, IEEE Transactions on Medical Imaging, vol. 10, No. 1, Mar. 1991, Atalar, et al.
Motion Artifact Suppression: A Review of Post-Processing Techniques, MRI, vol. 10, pp. 627-635, 1992, Hedley, et al.
Diffusion-Weighted Multiple Shot Echo Planar Imaging of Humans without Navigation, MRM 38 82-88 1997, Robson, et al.
MRI Artifact Cancellation Due to Rigid Motion in the Imaging Plane, IEEE Transactions on Medical Imaging, vol. 15, No. 6, Dec. 1996, Zoroofi, et al.
An Improved Algorithm for 2-D Translation Motion Artifact Correction, IEEE Transaction on Medical Imaging, vol. 10, No. 4, Dec. 1991, Hedley, et al.

ART-UNIT: 282

PRIMARY-EXAMINER: Arana; Louis

ATTY-AGENT-FIRM: Quarles & Brady, LLP

ABSTRACT:

An MRI image is corrected for motion artifacts using an iterative, autocorrection process in which corrections are tried and the quality of the resulting reconstructed image is measured. Different metrics for evaluating image quality are used during the autocorrection process to take advantage of their different attributes.

11 Claims, 3 Drawing figures

☐ 7. Document ID: US 6647134 B1 Relevance Rank: 39

L11: Entry 10 of 15 File: USPT Nov 11, 2003

US-PAT-NO: 6647134
DOCUMENT-IDENTIFIER: US 6647134 B1

TITLE: Autocorrection of MR projection images

DATE-ISSUED: November 11, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
McGee; Kiaran P.	Rochester	MN		
Felmlee; Joel	Rochester	MN		
Ehman; Richard	Rochester	MN		
Manduca; Armando	Rochester	MN		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Mayo Foundation for Medical Education and Research	Rochester	MN			02

APPL-NO: 09/595282 [PALM]
DATE FILED: June 15, 2000

PARENT-CASE:
RELATED PATENT APPLICATION This application claims benefit of Provisional Application Ser. No. 60/193,119 filed on Mar. 30, 2000.

INT-CL-ISSUED: [07] G06 K 9/00

US-CL-ISSUED: 382/128; 382/130
US-CL-CURRENT: 382/128; 382/130

FIELD-OF-CLASSIFICATION-SEARCH: 382/128, 382/130
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4431968	February 1984	Edelstein et al.	324/309
4567893	February 1986	Charles et al.	600/410
4609872	September 1986	O'Donnell	324/306
4663591	May 1987	Pelc et al.	324/309
4665365	May 1987	Glover et al.	324/309
4706026	November 1987	Pelc et al.	324/309
4714081	December 1987	Dumoulin et al.	600/419
4731583	March 1988	Glover et al.	324/309
4937526	June 1990	Ehman et al.	324/309
4952877	August 1990	Stormont et al.	324/312
4992736	February 1991	Stormont et al.	324/309
5055789	October 1991	Kondo et al.	324/309
5204627	April 1993	Mistretta et al.	324/309
5592085	January 1997	Ehman	324/309

5603323	February 1997	Pflugrath et al.	600/437
5825186	October 1998	Ehman et al.	324/309
6263230	July 2001	Haynor et al.	600/424
6329819	December 2001	Manduca et al.	324/309
6400841	June 2002	Khoury	382/154

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
WO98/01828	January 1998	WO	

OTHER PUBLICATIONS

Autofocusing of Clinical Shoulder MR Images for Correction of Motion Artifacts, Mayo Clinic, Rochester MN, Manduca, et al.
Automatic Correction of Motion Artifacts in Magnetic Resonance Images Using an Entropy Focus Criterion, IEEE Transactions on Medical Imaging, vol. 16, No. 6, Dec. 1997, Atkinson, et al.
An Autofocus Algorithm for the Automatic Correction of Motion Artifacts in MR Images, Lecture Notes in Computer Science, 15.sup.th International Conference, IPMI '97, Atkinson, et al.
A Respiratory Motion Artifact Reduction Method In Magnetic Resonance Imaging of the Chest, IEEE Transactions on Medical Imaging, vol. 10, No. 1, Mar. 1991, Atalar, et al.
Motion Artifact Suppression: A Review of Post-Processing Techniques, MRI, vol. 10, pp 627-635, 1992, Hedley, et al.
Diffusion-Weighted Multiple Shot Echo Planar Imaging of Humans without Navigation, MRM 38 82-88 1997, Robson, et al.
MRI Artifact Cancellation Due to Rigid Motion in the Imaging Plane, IEEE Transactions on Medical Imaging, vol. 15, No. 6, Dec. 1996, Zoroofi, et al.
An Improved Algorithm for 2-D Translation Motion Artifact Correction, IEEE Transaction on Medical Imaging, vol. 10, No. 4, Dec. 1991, Hedley, et al.

ART-UNIT: 2621

PRIMARY-EXAMINER: Boudreau; Leo

ASSISTANT-EXAMINER: Akhavannik; Hussein

ATTY-AGENT-FIRM: Quarles & Brady, LLP

ABSTRACT:

An MRA image is corrected for motion artifacts using an iterative, autocorrection process in which corrections are tried and the quality of the resulting reconstructed image is measured. Corrections are made to the acquired three-dimensional data while the metric which measures image quality is applied to a two-dimensional projection image.

12 Claims, 3 Drawing figures

☐ 8. Document ID: US 6469506 B1 Relevance Rank: 39

L11: Entry 11 of 15 File: USPT Oct 22, 2002

US-PAT-NO: 6469506
DOCUMENT-IDENTIFIER: US 6469506 B1

TITLE: Autocorrection of MR images acquired using phased-array coils

DATE-ISSUED: October 22, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Felmlee; Joel P.	Rochester	MN		
McGee; Kiaran P.	Rochester	MN		
Ehman; Richard L.	Rochester	MN		
Manduca; Armando	Rochester	MN		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Mayo Foundation for Medical Education and Research	Rochester	MN			02

APPL-NO: 09/595272 [PALM]
DATE FILED: June 15, 2000

PARENT-CASE:
RELATED APPLICATIONS This application claims benefit of provisional application Serial No. 60/166,432 filed on Nov. 19, 1999.

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/309; 324/307, 324/312
US-CL-CURRENT: 324/309; 324/307, 324/312

FIELD-OF-CLASSIFICATION-SEARCH: 324/309, 324/307, 324/306, 324/308, 324/310, 324/311, 324/312, 324/300, 324/313, 324/314, 324/318, 324/322
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5086275	February 1992	Roemer	324/309
6184682	February 2001	Ehman et al.	324/309
6265874	July 2001	McGee et al.	324/309
6307369	October 2001	Felmlee et al.	324/309
6329819	December 2001	Manduca et al.	324/309

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
WO99/53444	October 1999	WO	

OTHER PUBLICATIONS

Autofocusing of Clinical Shoulder MR Images for Correction of Motion Artifacts, Mayo Clinic, Rochester MN, Manduca, et al.
Automatic Correction of Motion Artifacts in Magnetic Resonance Images Using an Entropy Focus Criterion, IEEE Transactions on Medical Imaging, vol. 16, No. 6, Dec. 1997, Atkinson, et al.
An Autofocus Algorithm for the Automatic Correction of Motion Artifacts in MR Images, Lecture Notes in Computer Science, 15.sup.th International Conference, IPMI '97, Atkinson, et al.
A Respiratory Motion Artifact Reduction Method In Magnetic Resonance Imaging of the Chest, IEEE Transactions on Medical Imaging, vol. 10, No. 1, Mar. 1991, Atalar, et al.
Motion Artifact Suppression: A Review of Post-Processing Techniques, MRI, vol. 10, pp 627-635, 1992, Hedley, et al.
Diffusion-Weighted Multiple Shot Echo Planar Imaging of Humans without Navigation, MRM 38 82-88 1997, Robson, et al.
MRI Artifact Cancellation Due to Rigid Motion in the Imaging Plane, IEEE Transactions on Medical Imaging, vol. 15, No. 6, Dec. 1996, Zoroofi, et al.
An Improved Algorithm for 2-D Translation Motion Artifact Correction, IEEE Transaction on Medical Imaging, vol. 10, No. 4, Dec. 1991, Hedley, et al.

ART-UNIT: 2862

PRIMARY-EXAMINER: Lefkowitz; Edward

ASSISTANT-EXAMINER: Fetzner; Tiffany A.

ATTY-AGENT-FIRM: Quarles & Brady, LLP

ABSTRACT:

An MRI image acquired with a phase-array coil is corrected for motion artifacts using an iterative, autocorrection process in which corrections are tried and the quality of the resulting reconstructed image is measured. In one embodiment autocorrections are calculated for the data acquired with one coil element and the same corrections are made to data acquired with the other coil elements. In another embodiment autocorrections are calculated separately for the data acquired with each coil element. In either embodiment, the separate corrected images are combined to form the output image.

4 Claims, 3 Drawing figures

☐ 9. Document ID: US 20050174114 A1 Relevance Rank: 38

L11: Entry 3 of 15 File: PGPB Aug 11, 2005

PGPUB-DOCUMENT-NUMBER: 20050174114
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050174114 A1

TITLE: Method and system for rapid magnetic resonance imaging of gases with reduced diffusion-induced signal loss

PUBLICATION-DATE: August 11, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Mugler III, John P.	Charlottesville	VA	US
Brookeman, James R.	Charlottesville	VA	US

APPL-NO: 10/514272 [PALM]
DATE FILED: November 12, 2004

RELATED-US-APPL-DATA:
non-provisional-of-provisional 60380760 20020515 US

PCT-DATA:

DATE-FILED	APPL-NO	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
May 14, 2003	PCT/US03/15136				

INT-CL-PUBLISHED: [07] G01 V 3/00

US-CL-PUBLISHED: 324/309; 324/314, 324/303
US-CL-CURRENT: 324/309; 324/303, 324/314

REPRESENTATIVE-FIGURES: 8

ABSTRACT:

A methodology, system and computer program product for designing and optimizing a rapid magnetic resonance imaging pulse sequence for creating images of a gas or gas-filled structure with substantially reduced diffusion-induced signal attenuation during the course of data acquisition compared to that for currently available magnetic resonance imaging techniques is disclosed. The methodology and system allows desirable combinations of image signal-to-noise ration, spatial resolution and temporal resolution to be achieved that were heretofore not possible. For example, magnetic resonance imaging of hyperpolarized noble gases, which recently has shown significant promise for several medical imaging applications, particularly imaging of the human lung, can be improved. Pulse sequences designed according to the subject methods permit signal levels to be achieved that are up to ten times higher than those possible with the gradient-echo methods now commonly used for hyperpolarized-gas imaging. This signal increase can be traded for substantially lower does, and hence much lower cost, of the hyperpolarized-gas agent. The methodology and system will also be useful for non-biological applications of hyperpolarized gases for example material science studies, as well as for magnetic resonance imaging of any other gas for biological or non-biological applications. Pulse sequences designed according to the subject methods can also serve as the foundation for a variety of specialized gas-imaging

pulse sequences, such as those for apparent-diffusion-coefficient, dynamic or oxygen-concentration imaging.

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority from U.S. Provisional Application No. 60/380,760, filed May 15, 2002, entitled "Method and Apparatus for Rapid Magnetic Resonance Imaging of Gases with Reduced Diffusion-Induced Signal Loss," the entire disclosure of which is hereby incorporated by reference herein.

☐ 10. Document ID: US 20040260173 A1 Relevance Rank: 37

L11: Entry 5 of 15 File: PGPB Dec 23, 2004

PGPUB-DOCUMENT-NUMBER: 20040260173
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040260173 A1

TITLE: Optimized high-speed magnetic resonance imaging method and system using hyperpolarized noble gases

PUBLICATION-DATE: December 23, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Salerno, Michael	Palo Alto	CA	US
Mugler III, John P.	Charlottesville	VA	US
Brookeman, James R.	Charlottesville	VA	US

APPL-NO: 10/474571 [PALM]
DATE FILED: October 14, 2003

RELATED-US-APPL-DATA:
non-provisional-of-provisional 60283918 20010413 US

PCT-DATA:

DATE-FILED	APPL-NO	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
Apr 12, 2002	PCT/US02/11746				

INT-CL-PUBLISHED: [07] A61 B 5/055

US-CL-PUBLISHED: 600/420
US-CL-CURRENT: 600/420

REPRESENTATIVE-FIGURES: 9

ABSTRACT:

A system and method for using hyperpolarized noble gases together with an appropriately designed and optimized magnetic resonancé imaging pulse sequence to rapidly acquire static or dynamic magnetic resonance images. The strong magnetic resonance signal from hyperpolarized gases, combined with the present magnetic resonance imaging technique, presents the opportunity for the imaging of gases with both high spatial and high temporal resolution. One potential application for such a method is the direct, dynamic visualization of gas flow, which would be extremely useful for characterizing a variety of fluid systems. In the medical field, one such system of substantial importance is the lung. The system and method provides for visualizing regional ventilatory patterns throughout the respiratory cycle with high temporal and high spatial resolution. The low sensitivity to susceptibility artifacts permits good image quality to be obtained in various orientations. Depending on the application, temporal resolution can be traded for anatomical coverage. Such application of dynamic imaging of the lung using hyperpolarized gases will provide unique information on the physiology and pathophysiology of the lung, and has the potential for many clinically-relevant applications.

RELATED APPLICATIONS

[0001] This application claims priority from U.S. Provisional Application Ser. No. 60/283,918 filed on Apr. 13, 2001, entitled "Optimized High-Speed Magnetic Resonance Imaging System Using Hyperpolarized Noble Gases and Related Method Thereof", the entire disclosure of which is hereby incorporated by reference herein.

☐ 11. Document ID: US 20040227512 A1 Relevance Rank: 33

L11: Entry 6 of 15 File: PGPB Nov 18, 2004

PGPUB-DOCUMENT-NUMBER: 20040227512
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040227512 A1

TITLE: Systems and methods for estimating properties of a sample

PUBLICATION-DATE: November 18, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Twieg, Donald Baker	Birmingham	AL	US

APPL-NO: 10/740731 [PALM]
DATE FILED: December 19, 2003

RELATED-US-APPL-DATA:
non-provisional-of-provisional 60437301 20021231 US

INT-CL-PUBLISHED: [07] G01 V 3/00

US-CL-PUBLISHED: 324/309; 324/307
US-CL-CURRENT: 324/309; 324/307

REPRESENTATIVE-FIGURES: 2A 2B

ABSTRACT:

Systems and methods for estimating properties of a sample are provided in which, for some embodiments, each datum of a set of data is modeled using a parameterized equation. The parameterized equation has multiple parameters, where each parameter represents a property of the subject. The parameterized equation is inverted, and the inverted parameterized equation provides an indication of one or more properties associated with the subject.

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. provisional patent application serial No. 60/437,301, filed on Dec. 31, 2002, having the title "Single Excitation Magnetic Resonance Imaging (MRI) Method and Device," which is incorporated herein by reference in its entirety.

☐ 12. Document ID: US 20050036944 A1 Relevance Rank: 33

L11: Entry 4 of 15 File: PGPB Feb 17, 2005

PGPUB-DOCUMENT-NUMBER: 20050036944
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050036944 A1

TITLE: Diffusion-weighted parallel imaging with navigator-signal-based phase correction

PUBLICATION-DATE: February 17, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Van Den Brink, Johan Samuel	Eindhoven		NL
Fuderer, Miha	Eindhoven		NL

APPL-NO: 10/498634 [PALM]
DATE FILED: June 14, 2004

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	DOC-ID	APPL-DATE
EP	0120909.4	2001EP-0120909.4	December 14, 2001

PCT-DATA:

DATE-FILED	APPL-NO	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
Dec 2, 2002	PCT/IB02/05113				

INT-CL-PUBLISHED: [07] A61 K 49/00, A61 B 5/055

US-CL-PUBLISHED: 424/009.3; 600/410
US-CL-CURRENT: 424/9.3; 600/410

REPRESENTATIVE-FIGURES: NONE

ABSTRACT:

A magnetic resonance imaging method for forming an image of an object from a plurality of signals acquired by an array of multiple receiver antennae, wherein spins are excited in a part of the object. MR signals are measured along a predetermined trajectory containing a plurality of lines in k-space by application of a read gradient and other gradients. Further, a navigator gradient is applied for the measurement of navigator MR signals and an additional gradient is applied in order to achieve diffusion sensitivity of the MR signal, wherein phase corrections are determined from phases and moduli of the navigator MR signals so as to correct the measured MR signals. An image of the part of the object is determined from the corrected MR signals. The corrected phase is determined from the weighted phase difference between a reference navigator signal for each antenna and the actual navigator MR signal of said antenna.

☐ 13. Document ID: US 20060028206 A1 Relevance Rank: 31

L11: Entry 1 of 15 File: PGPB Feb 9, 2006

PGPUB-DOCUMENT-NUMBER: 20060028206
PGPUB-FILING-TYPE:
DOCUMENT-IDENTIFIER: US 20060028206 A1

TITLE: MRI method and apparatus for faster data acquisition or better motion artifact reduction

PUBLICATION-DATE: February 9, 2006

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Zhang; Qiang	Chicago	IL	US
Simonetti; Orlando	Naperville	IL	US

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	COUNTRY	TYPE CODE
Siemens Aktiengesellschaft				02

APPL-NO: 10/911795 [PALM]
DATE FILED: August 5, 2004

INT-CL-PUBLISHED:

TYPE	IPC	DATE	IPC-OLD
IPCP	G01V3/00	20060101	G01V003/00

INT-CL-CURRENT:

TYPE	IPC	DATE
CIPP	G01 V 3/00	20060101

US-CL-PUBLISHED: 324/309; 324/307
US-CL-CURRENT: 324/309; 324/307

ABSTRACT:

In a method and apparatus for generating a magnetic resonance image, raw magnetic resonance data are acquired from a subject for each of a number of PROPELLER strips using, for each strip, multiple magnetic resonance reception coils in a partial acquisition technique (PAT), and the raw data in said PROPELLER strips are entered into k-space according to the PROPELLER scan. A PAT reconstruction of the data in k-space is conducted dependent on the respective sensitivities of the reception coils, and a PROPELLER reconstruction of the data in k-space is conducted after the PAT reconstruction for generating a magnetic resonance image of the subject.

☐ 14. Document ID: US 6774628 B2 Relevance Rank: 28

L11: Entry 9 of 15 File: USPT Aug 10, 2004

US-PAT-NO: 6774628
DOCUMENT-IDENTIFIER: US 6774628 B2

TITLE: Nuclear magnetic resonance imaging using phase encoding with non-linear gradient fields

DATE-ISSUED: August 10, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ganesan; Krishnamurthy	Sugar Land	TX		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Schlumberger Technology Corporation	Sugar Land	TX			02

APPL-NO: 10/051479 [PALM]
DATE FILED: January 18, 2002

INT-CL-ISSUED: [07] G01 V 3/00

US-CL-ISSUED: 324/303
US-CL-CURRENT: 324/303

FIELD-OF-CLASSIFICATION-SEARCH: 324/303
See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4717878	January 1988	Taicher et al.	324/303
5055787	October 1991	Kleinberg et al.	324/303
5212447	May 1993	Paltiel	324/300
5280243	January 1994	Miller	324/303
5345176	September 1994	LeRoux et al.	
5410249	April 1995	Van Yperen et al.	
5428291	June 1995	Thomann et al.	324/303
5473158	December 1995	Holenka et al.	250/254
5565775	October 1996	Stallmach et al.	324/303
5629623	May 1997	Sezginer et al.	
5696448	December 1997	Coates et al.	324/303
5757186	May 1998	Taicher et al.	324/303
5796252	August 1998	Kleinberg et al.	324/303
5892460	April 1999	Jerabek et al.	340/856.4
5914598	June 1999	Sezginer et al.	
5977768	November 1999	Sezginer et al.	324/303
6018243	January 2000	Taicher et al.	324/303
6111408	August 2000	Blades et al.	324/303
6121773	September 2000	Taicher et al.	324/303
6147489	November 2000	Freedman et al.	324/303
6166540	December 2000	Wollin	324/300
6181138	January 2001	Hagiwara et al.	324/338
6232778	May 2001	Speier et al.	
6237404	May 2001	Crary et al.	
6246236	June 2001	Poitzsch et al.	324/303
6255817	July 2001	Poitzsch et al.	324/303
6268726	July 2001	Prammer et al.	324/303
6291995	September 2001	Speier et al.	
6297632	October 2001	Speier	
6326784	December 2001	Ganesan et al.	324/303
6342784	January 2002	Wollin	324/303
6366089	April 2002	Poitzsch et al.	
6373248	April 2002	Poitzsch et al.	
6392410	May 2002	Luong et al.	
6400149	June 2002	Luong et al.	
6492809	December 2002	Speier et al.	
6518757	February 2003	Speier	
6518758	February 2003	Speier et al.	
6522136	February 2003	Hurlimann et al.	324/303
6522137	February 2003	Sun et al.	324/303
6528995	March 2003	Speier et al.	
6531869	March 2003	Speier et al.	

6538438	March 2003	Speier et al.
6566874	May 2003	Speier et al.
6570381	May 2003	Speier et al.

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
0 675 372	October 1995	EP	
WO01/46549	June 2001	WO	
WO 03/040743	May 2003	WO	

OTHER PUBLICATIONS

Kenyon et al., Nuclear Magnetic Resonance Imaging-Technology for the 21.sup.st Century, CPMG Pulse Sequence, pp. 19-33 (1995).

ART-UNIT: 2859

PRIMARY-EXAMINER: Gutierrez; Diego

ASSISTANT-EXAMINER: Vargas; Dixomara

ATTY-AGENT-FIRM: McEnaney; Kevin P. Jeffery; Brigitte L. Ryberg; John H.

ABSTRACT:

One embodiment of the present invention is a method for nuclear magnetic resonance imaging of an investigation region of formation surrounding a wellbore. The method comprises the steps of applying a series of magnetic field gradients to phase encode nuclear spins within the investigation region, wherein the strength of the magnetic field gradient applied is different from at least one previously applied magnetic field gradient within the series. Nuclear magnetic resonance signals are detected from the investigation region resulting from the series of magnetic field gradients.

73 Claims, 30 Drawing figures

☐ 15. Document ID: US 20030137297 A1 Relevance Rank: 28

L11: Entry 8 of 15 File: PGPB Jul 24, 2003

PGPUB-DOCUMENT-NUMBER: 20030137297
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030137297 A1

TITLE: Nuclear magnetic resonance imaging using phase encoding

PUBLICATION-DATE: July 24, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY
Ganesan, Krishnamurthy	Sugar Land	TX	US

APPL-NO: 10/051479 [PALM]
DATE FILED: January 18, 2002

INT-CL-PUBLISHED: [07] G01 V 3/00

US-CL-PUBLISHED: 324/303
US-CL-CURRENT: 324/303

REPRESENTATIVE-FIGURES: 1 2 3

ABSTRACT:

One embodiment of the present invention is a method for nuclear magnetic resonance imaging of an investigation region of formation surrounding a wellbore. The method comprises the steps of applying a series of magnetic field gradients to phase encode nuclear spins within the investigation region, wherein the strength of the magnetic field gradient applied is different from at least one previously applied magnetic field gradient within the series. Nuclear magnetic resonance signals are detected from the investigation region resulting from the series of magnetic field gradients.

Term	Documents
(7 AND 5 AND 4 AND 3 AND 6 AND 10).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15
(L10 AND L7 AND L6 AND L5 AND L4 AND L3).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	15